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The TOBACCO BUDWORM

AND ITS CONTROL IN THE GEORGIA AND FLORIDA TOBACCO-GROWING REGION

IN THE Georgia-Florida tobacco belt the ravages of the tobacco budworm are ordinarily exceeded only by those of one other insect attacking the crop. The larvæ, or "worms," hatching from eggs laid on the leaves by a greenish moth, begin their depredations as soon as they have migrated to the buds, usually about 24 hours after emergence.

To avert attacks of these worms, seed beds should be tightly covered with cloth to prevent entrance of moths, and the plants in them thoroughly destroyed as soon as the beds are abandoned. Where tobacco is grown under cheesecloth the walls and tops of the covering should be as tightly closed as possible and openings for the passage of workmen, farm animals, and implements should be carefully guarded. At the end of the harvesting season all tobacco stalks should be destroyed. A further useful practice is the plowing of tobacco fields in the fall or winter.

For control of the worms, a poisoned bait made by mixing 75 pounds of corn meal with 1 pound of lead arsenate is efficient. Larger quantities of the poison are of no greater value and may injure the plants. The number, method, and frequency of applications needed will depend upon conditions fully set forth in this bulletin.

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THE TOBACCO BUDWORM[1] AND ITS CONTROL IN THE GEORGIA AND FLORIDA TOBACCO-GROWING REGION

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A DESTRUCTIVE TOBACCO PEST

THROUGHOUT the Georgia-Florida tobacco belt the annual depredations of the tobacco budworm are ordinarily exceeded only by those of the hornworm.[2] In the tobacco-growing regions farther north this insect is considered only a minor pest; in some seasons, however, it may cause considerable damage.

Although the budworm attacks all the different types of tobacco grown in this region, injury to leaves used as cigar wrapper means much more than injury to leaves which are to be used for filler or for other purposes. The injury occurring in the filler and bright types, however, is so great as to necessitate control practices.

Fortunately, very simple and efficient measures for the control of this pest are at the command of the tobacco grower.

DESCRIPTION, LIFE HISTORY, AND HABITS

The tobacco budworm passes through four distinct stages in the course of its development; the egg, the larva or worm, the pupa, and the adult, or moth. The eggs are small, whitish, nearly dome-shaped objects, measuring about one-fiftieth of an inch in diameter. They are laid singly by the moth, usually on the underside of the tobacco leaves. In hot weather from three to five days are required for hatching.

Newly hatched budworms first feed sparingly on the shells of the eggs from which they have issued and then eat from the leaf surface small areas about the size of a pinhead. The small budworms then begin to pass to the bud of the plant, which is usually reached in about 24 hours. They frequently stop to feed on the leaf surface, but as this feeding seldom goes entirely through the leaf no appreciable injury is done until the bud is reached.

[1] *Heliothis virescens* Fab.; order Lepidoptera, family Noctuidae.
[2] *Protoparce sexta* Joh.

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Upon reaching the bud the young worms conceal themselves between the immature leaves and begin feeding ravenously. They are so small and so well concealed that they can be detected only by opening and carefully scrutinizing the bud.

From 18 to 31 days are required for the development of the larva, or worm, in May and June. At maturity the larva attains a length of about an inch and a half. (Fig. 1.) Its most common color is light green, with paler stripes running lengthwise of the body; but the color may vary from green to yellowish or dark reddish brown, or it even may become very dark. When fully grown the budworm enters the soil and changes to the pupa.

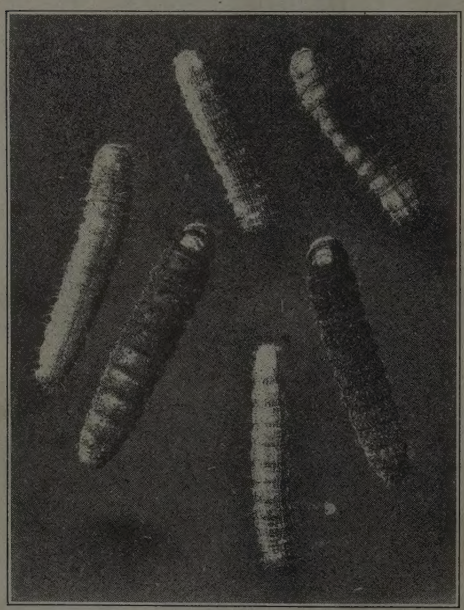

FIG. 1.—Tobacco budworms, nearly full grown

The pupal or resting stage (fig. 2), which is spent about an inch beneath the surface of the soil, usually requires, in the summer months, about 12 days. The pupa is about three-fourths of an inch in length and is brown in color.

The adult form of the budworm is a distinctively greenish-colored moth (fig. 3) with a wing spread of about 1¼ inches. The fore wings are of a light green color, obliquely crossed with three lighter stripes, while the hind wings are silvery in color and bordered with a brownish fringe. The moth is active only at night, but in the daytime is frequently found hidden among the tobacco leaves. When disturbed it darts quickly to a new hiding place.

NATURE OF THE INJURY

Injury to the tobacco plant is caused only by the larva, or worm stage, of the budworm. Although some damage is done by the larger larvae feeding on the mature foliage, by far the greater part of the injury is produced in the small, immature bud leaves, and begins to occur as soon as the tiny worms, which hatch from eggs on the outer leaves, reach the bud. Distorted leaves often result when feeding is done upon the tips of the leaves in the developing bud. When the attack is made elsewhere large, unsightly holes develop as the leaf tissue expands. (Fig. 4.) Both types of injury greatly lower the

value of wrapper tobacco, and depreciate the value of the bright and filler types. (Fig. 5.) If the worms are not controlled they may feed upon the plants to such an extent as to cause a considerable loss in weight. (Fig. 6.) Frequently the entire bud may be eaten away, with the consequent stunting of the plant.

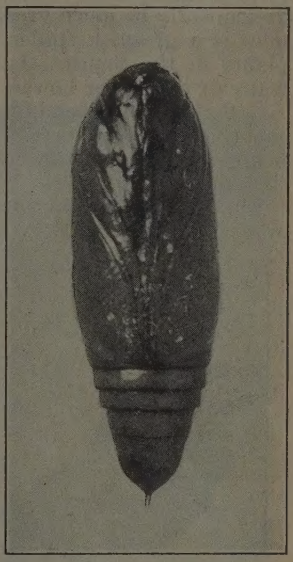

FIG. 2.—Pupa of the tobacco budworm (greatly enlarged)

SEASONAL HISTORY

In Georgia and Florida the moths sometimes appear early enough in the spring to infest the seed beds. Usually the young worms begin to appear in destructive numbers about the time when tobacco plants have become established in the fields. From this time until the end of the growing season eggs and larvae are present in tobacco fields.

The first generation of the budworm requires about 46 days for its complete life cycle, but the later generations may complete their development in a period of about 33 days.

The first two broods confine themselves almost entirely to tobacco. They overlap to a great extent, and their numbers are sufficiently large to keep tobacco fields thoroughly infested throughout their entire period of growth.

The third brood is present mainly during the latter part of July and during August. Individuals of this brood feed upon late tobacco and upon beggarweed,[3] which becomes abundant at this season of the year.

FIG. 3.—The adult, or moth, of the tobacco budworm. In its natural position at rest and with wings spread

A fourth and possibly a fifth brood are also present in the fall months. The winter is passed in the pupal state, in the ground.

FOOD PLANTS

Tobacco and beggarweed are the preferred food plants of the tobacco budworm. Aside from these two hosts, the larvae feed to a limited extent upon tomatoes, garden peas, sweet peas, and a number of wild and cultivated plants. The corn earworm,[4] which closely resembles the tobacco budworm, and is sometimes called the false budworm, seldom attacks tobacco in this region.

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[3] Species of Meibomia.

[4] *Heliothis obsoleta* Fab.

NATURAL ENEMIES

If it were not for the assistance of numerous parasitic and predacious enemies of the budworm, the infestations in tobacco fields would undoubtedly be much greater. One of the important predacious enemies is a greenish spider,[5] which is extremely common on tobacco plants in the South. Another is a certain wasp,[6] which destroys many of the larger larvae.

A fly [7] closely resembling the common house fly acts as a parasitic enemy of the budworm. It deposits in the body of the worm tiny maggots which burrow into their host, and after feeding for some time finally destroy it.

The most important natural enemy of the tobacco budworm, however, is a small, black-winged, red-bodied, wasplike insect [8] (fig. 7)

FIG. 4.—Tobacco bud, showing serious budworm injury

which is often seen hovering around the tobacco plants. Upon finding a small budworm, this insect quickly inserts an egg into its body. The parasite which hatches from the egg feeds within the body of the budworm and ultimately destroys it. The mistaken impression has existed in this region that the adult parasite found flying around tobacco buds is the parent of the budworm.

CONTROL

THE USE OF POISONED CORN MEAL

The nature of the attack of the budworm necessitates direct applications of poison to the affected bud, if efficient control is to be ob-

[5] *Peucetia viridans* Hentz.
[6] *Polistes bellicosus* Cress.
[7] *Sarcophaga sternodontis* Towns.
[8] *Cardiochiles nigriceps* Vier.

tained. Neither dusting nor spraying of plants has given satisfactory control.

At the present time the best-known method of controlling the tobacco budworm is by applying poisoned corn meal to the buds attacked. A mixture which has proven very satisfactory consists of 1 pound of lead arsenate and 75 pounds of corn meal, or 6 heaping teaspoonfuls of the arsenical to 1 peck of corn meal.

FIG. 5.—Illustration of injury caused by the tobacco budworm. Cured leaves, injured (right) and uninjured (left)

HOW TO PREPARE THE BAIT

In the preparation of the bait care should be taken to obtain an even distribution of the poison throughout the corn meal. The corn meal should not contain much coarse husk. Small quantities of the bait can be prepared by mixing the ingredients by hand in a bucket or some other container. Mechanical mixers can be employed where large quantities are to be prepared. Mixtures containing a greater proportion of poison are found to be no more effective. Moreover, this mixture may be used with a greater degree of safety than other preparations which in some instances give fairly good budworm con-

trol. About 12 pounds of the mixture, or 1 peck, per acre is necessary for each application.

Cottonseed meal, lime, sand, and other substances are sometimes used in place of corn meal in the poison mixture, but have been found

FIG. 6.—Budworm injury to bright tobacco. Injured plant at left, uninjured plant at right

to be much inferior. The extreme efficiency of the mixture of corn meal and lead arsenate is due to the attractiveness of the corn meal to the tobacco budworm.

FIG. 7.—*Cardiochiles nigriceps*, an important parasite of the tobacco budworm

Calcium arsenate and Paris green should not be used as substitutes for arsenate of lead, as under certain weather conditions they may cause severe burning of the foliage.

Caution.—As this mixture is both attractive and very poisonous to domestic animals, it should always be kept in a safe place.

HOW AND WHEN TO APPLY THE POISON

A small quantity of the poison mixture should be dropped with the hand into the center of the bud. The necessity of applying the mixture directly to the bud is greatly emphasized, since applications carelessly made are of small value. The first two or three applications may be made by means of a quart can, fastened to a stick, with 10-penny nail holes in the bottom. (Fig. 8.) As the plants increase in size the bud leaves become more tightly folded and it is then necessary to apply the remedy with the hand. (Fig. 9.) When the buds are closed they should be opened with one hand while a small pinch of the poison mixture is dropped in with the other. The poisoned bait can be conveniently carried in a small cloth sack or bag, attached to the waist, thus allowing the operator full freedom of both hands. Although the application with the can is somewhat quicker than that with the hand, some growers of wrapper tobacco prefer to use the latter exclusively. An adult laborer should be able to treat from 1 to 2 acres per day, the area depending somewhat upon the type and age of the tobacco.

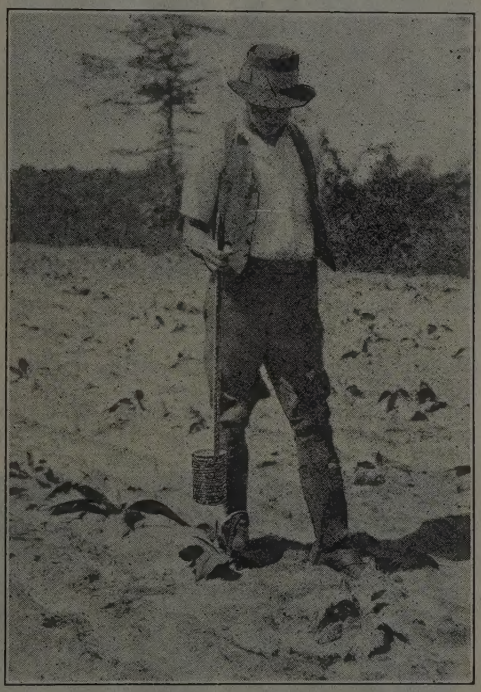

FIG. 8.—Applying poison mixture to the tobacco buds by the stick and cup method

The advisability of applying only a small pinch of the poison mixture to each bud should be emphasized, as excessive quantities may cause some injury to the tender bud leaves in wet weather. This applies especially to shade-grown wrapper tobacco, the bud leaves of which are very susceptible to injury by poison.

In the case of cigar-wrapper and filler tobacco, poisoning should commence as soon as the plants have become established in the field. Experience has shown that at least two applications a week are necessary to protect the bud fully during normal growing weather. When growth is much retarded by severe drought one application per week may be sufficient and will avoid an excessive accumulation of poison on the plant. The applications must be continued until the tobacco is topped.

In the case of bright or cigarette tobacco the number of poison applications necessary will vary from one season to another. It appears, however, that from three to five applications of the poison mixture during the early part of the season will ordinarily give all the protection needed for this type of tobacco. Applications should be begun when a careful examination of the buds indicates that the small worms are becoming numerous, and should be made approximately one week apart.

FIG. 9.—Applying poison mixture to the tobacco buds with the fingers

GENERAL RECOMMENDATIONS

Seed beds should be tightly covered with cloth to prevent the entrance of moths. In this way the number of eggs introduced into the fields on the plants will be held to a minimum.

The plants in seed beds should be thoroughly destroyed as soon as the beds are abandoned. If allowed to grow throughout the season they serve as excellent breeding places for this pest and contribute considerably to the abundance of moths which deposit eggs within the fields. (Fig. 10.)

FIG. 10.—Grown-up seed bed which serves as a breeding place for the tobacco budworm

Where tobacco is grown under cheesecloth, preventive measures against budworm attack may be practiced with considerable success. In such cases the walls and top should be kept as tight as possible. Since it is necessary to provide openings in these shades through which workmen with farm animals and implements may come and go, gates covered with cloth should be provided and kept closed as much as possible to exclude moths.

At the end of the harvesting season tobacco stalks should be cut down or otherwise destroyed. Plants left standing in the fields provide breeding places for the budworm as well as for other insect pests.

The plowing of tobacco fields in the fall or winter months undoubtedly results in the destruction of many budworm pupæ in the soil, thereby reducing the number of moths which emerge in the following spring. This practice is also very destructive to the tobacco hornworm, which overwinters in the soil.

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